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China Embarks on the Road to Big Science

Whatever virtue there may be in professors taking turns as ditchdiggers, China's post-Mao political and scientific leadership has decided that scientific quality should take precedence over ideological purity — and scientists should stick to the laboratory.

That's the main message to be found in the proceedings of China's National Science Conference, which was held March 18-31 in Peking. Reportedly attended by over 5000 researchers and political officials of high and low rank, the conference put an official seal on the dismantling of the Cultural Revolution's abuse of traditional science as bourgeois and elitist. And, conceivably, it set the People's Republic of China on a long journey toward scientific equality with the advanced Western nations.

Since the successful completion of that journey is far off and, conceivably, uncertain, there is no imminent prospect of China soon emerging as a major scientific, and, by extension, industrial, power. But as papers from the conference have circulated around Washington, assorted China watchers generally agree that the Chinese are talking science with fervor, reality, and intelligence, and that given good luck, internal stability, and continued determination, they could easily pull off a "miracle" and be up to world scientific standards by their end-of-the-century goal. What effect that would have on international relations is difficult to assess at this point. But assuming that science, industry, military power, and agriculture are all tightly linked with each other, the effect would not be slight. And, from the perspective of what they're planning to do to develop their research resources, it is important to note that the Chinese regard science as the key to prowess in all the other fields.

To the fascination, and usually the abhorrence, of many Western observers, the great boast of the Cultural Revolution was its dismantling of China's struggling post-war scientific renaissance. Condemned for being out of touch with the masses, scientists were required to engage in manual labor, admissions to universities were based on political rather than traditional academic criteria, and many research organizations were either closed down or subjected to so much harassment that their research programs virtually ceased. This process, it must be noted, was not without Western admirers who regarded it as a pioneering venture into making science responsive to the needs of the masses. But in any case, by the traditional standards of what makes a scientific community tick and produce, the Cultural Revolution apparently brought havoc to China's scientific community.

The post-Mao leadership now says it was all a mistake — and they say it with so much passion, that one veteran China watcher in Washington speculates that China's scientific and political leadership has swallowed intact the Western dogma that science works best when it is insulated from politics. As this observer put it, "Their scientists have been visiting our best re-

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In Brief

The National Science Foundation would be barely touched by the mammoth consolidation of government programs that's been proposed for creation of a Department of Education, since NSF would lose only those program activities designed to upgrade school and college science teaching. But it probably won't lost 'em anyway. The proposal apparently faces smooth sailing in the Senate, but is given little chance of clearing the House.

The competitiveness of US high-technology exports — increasingly a politically volatile subject — will be examined May 16 in a joint hearing before the Science, Technology and Space subcommittee and the International Finance subcommittee, both chaired by Senator Adlai Stevenson (D-Ill.) Topics will include rates of investment in R&D and proposals for limits on exports of US technological know-how.

Influence calibrators in Washington have noted that White House Science Adviser Frank Press did not attend the recent Camp David summit of Cabinet officers and senior White House staff members. Staff aides say that Press was invited but was excused because of the death of his brother.

China's Masterplan for Scientific Prowess

Since masterplans for achieving scientific excellence are easy to write and difficult to fulfill, China's newly announced "National Plan for the Development of Science and Technology 1978-1985" must be seen at this point as no more than an ambitious design.

Nevertheless, what must also be noted is that the ambition is coupled with a candid recognition of China's scientific backwardness and a realistic assessment of what must be done to overcome it. The National Plan is by no means a quickie scheme. Rather, starting from the premise that China is 15-20 years behind world standards in science, it aims to cut this gap to 10 years by 1985; by the end of the century, the goal is to be even with, perhaps ahead of, presentday leaders in science. To accomplish this, it was emphasized by Fang I, head of the State Scientific and Technical Commission, China must liberate its science from political governance and diligently cultivate scientific links with the industrialized nations.

The 1978-85 plan is neither modest nor flightily conceived. Rather, in its delineation of eight research areas for intensive development, it looks like a sound design for laying down a foundation for achieving the century-end goal of scientific excellence across the board.

As outlined by Minister Fang in an address to the National Science Conference, the following are the main points of the 1978-85 development plan:

Agriculture: With the ultimate aim a massive increase in agricultural productivity, the research plan starts with a comprehensive survey of present farm, forestry and fishery resources, and goes on to call for establishing "up-to-date centers" for experimentation in all relevant research subjects. Fang also stated, "We must lay great emphasis on research in the basic theories of agricultural science, step up our study in the application of agricultural biology, agricultural engineering and new technologies . . . so as to lay a solid scientific foundation for constant innovations in agrotechniques and steady expansion of production."

Energy: Research will be accelerated for the development of conventional sources, including "as our chief research subjects the key technical problems in building large hydroelectric power stations and thermal power stations at pit mouths." The plan also states that China should accelerate nuclear research "and speed up the building of atomic powerplants," and "step up research in solar energy, geothermal energy, wind power, tide energy, and controlled thermonuclear fusion. . ."

Materials: Here, too, the plan calls for a comprehensive effort, ranging from mining of commonplace minerals to development of new materials and waste-recovery systems. "We should devote great efforts to basic research on the science of minerals," Fang stated, "develop new experimental techniques and testing methods and gradually be able to design new materials with specified properties."

Computers: Noting that "The scientific and technical level, scope and production and extent and application of computers has become a conspicuous hallmark of the level of modernization of a country," the plan modestly states, "We aim to acquire by 1985 a comparatively advanced force in research in computer science and build a fair-sized modern computer industry."

Lasers: The plan states that lasers represent "a new stage in man's control and utilization of light waves," and states that laser science and technology is to be highly developed in all research fields, including "separation of isotopes and laser-induced fusion. Laser technology," it adds, "should be popularized in all departments of the national economy and national defense."

Space: Citing the value of space capabilities for research, military purposes, communications and resource studies, the plan calls for building "modern centers for space research . . . the launching of skylabs and space probes . . . and . . . extensive research in the basic theory of space science and the application of space technology."

High-Energy Physics: Described in the plan as "one of the most active frontline branches of study in the development of natural science in our time," high-energy physics has apparently been singled out for especially rapid development. "We expect to build a modern high-energy physics experimental base in ten years, completing a proton accelerator with a capacity of 30,000 million to 50,000 million electron volts in the first five years and a giant one with a still larger capacity in the second five years," the plan states.

Genetic Engineering: Acknowledging that China has "only a rather weak foundation" in this subject, the plan says, "It is likely to open new vistas for momentous changes in agriculture, industry, medicine and certain other fields of production." The next three years, it states, should be devoted to building up research facilities and conducting basic studies. With a properly developed base, it predicts, "fairly big progress" can be achieved in the next eight years."

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search centers and our scientists have been visiting their political leaders. And it sounds like they've been sold on the traditional ways of Western science."

This interpretation holds up when the speeches at the Peking conference are examined. For example, the Cultural Revolution and the notorious "Gang of Four" took pride in severing China's ties with Western science. No point, it was formerly argued, in perpetuating bourgeois practices.

Condemning scientific isolation, however, Party Chairman Hua Kuo-feng told the Peking conference that the value of knowledge is independent of national origin.

"Can we refuse to study Marxism because its birthplace was in the West? Can we refuse to learn from the Great October Socialist Revolution because it took place in Russia?" Of course not, he said.

"As for natural science and technology," he continued, "we are behind advanced world levels. We admit our backwardness but we refuse to stay backward. We must catch up. We must, therefore, be good at absorbing whatever is valuable in things foreign, take them and turn them to our own use, and combine our learning from foreign countries with our own inventiveness so that we can catch up with and surpass advanced world levels as soon as possible. We should learn from foreign countries now. But should we do so when we overcome our backwardness and become advanced? Yes, because even then other countries will still have points worth learning, and we should still study them. What is wrong with that? After ten thousand years, we must still learn from others!"

Chairman Hua is the boss and as keynote speaker he established wide boundries for what is politically proper in China's scientific revival. Details were then filled in by Vice Chairman Teng Hsiao-ping, who came on strong with a condemnation of bygone days when the Gang of Four "could willfully sabotage the cause of science and persecute the intellectuals."

Let Scientists Run Science

"The basic task of scientific research institutes is to produce scientific results and train competent people. . . . We should give the director and the deputy director of research institutes a free hand in the work of science and technology according to their division of labor. . . . We must listen closely to experts' opinions and enable them to play their full role so that we can do better at scientific and technical work and reduce our errors as much as possible."

—Teng Hsiao-ping, Vice Chairman
Central Committee, People's Republic of China

Sounding very much in touch with contemporary research, Teng said that recent developments in science are responsible for "A series of new-born industries, including high-polymer synthesis, atomic energy, electronic computers, semi-conductors, astronautics and lasers. . ." And then taking up the theme that scientists are the best judges of what to research and that they should not be held to close account for practical results, Teng said:

"Of course there are now and there will be many theoretical research topics with no practical application in plain sight for the time being. But a host of historical facts have proved that once a major breakthrough is scored in theoretical research, it means tremendous progress for production and technology sooner or later." (American scientists laboring under the political burdens of "relevancy" might wish to quote Vice Chairman Teng to their tormentors).

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. . . Okay for Scientists to Stick to Science

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Attacking the Gang of Four for deprecating intellectual labors, Teng said that "brain workers who serve socialism are a part of the working people" and should not be regarded as antagonists of the masses. And, following up on Chairman Hua's call for learning from other countries, he said, "We must actively develop international academic exchanges and step up our friendly contacts with scientific circles of other countries." (This policy is already being implemented through recently arranged scientific links with Japan, Romania and France — SGR Vol. VIII, No. 6. Official scientific ties with the US remain low-level because of Chinese insistence on a US break with Taiwan as a condition for expansion. But the Chinese have been expanding their contacts with American scientific and professional societies).

Turning to the sensitive issue of political participation by scientists, Teng flatly took the position that scientists should stick to science. Referring to a previous recommendation that scientists be allowed to spend at least five-sixths of their time on science — with the remainder, presumably, set aside for political activities — Teng said that five-sixths should be regarded as a minimum. "It is still better if even more time is available for this purpose. If some persons work seven days and seven evenings on end to meet the demands of science or production," he said, "that shows their lofty spirit of selfless devotion to the cause of socialism. We should learn from them, commend them, and encourage them. Innumerable facts prove that only he can mount the pinnacles of science who devotes himself heart and soul, constantly strives for perfection, fears neither hardship nor disappointment."

And then, in a direct jab at the Cultural Revolution's insistence on political activity by scientists, he added:

"We cannot demand that scientists and technicians, or at any rate, the overwhelming majority of them, study a lot of political and theoretical books, participate in numerous social activities, and attend many meetings not related to their work. . . . How can our scientists and technicians be accused of being divorced from politics when they work diligently for socialist science?. . ."

Again hitting at the previous regime, this time for establishing political criteria for admission to scientific training, Teng said, "On the question of talented people, we must particularly stress the need to break with convention in the discovery, selection, and training of those with outstanding talent. This was one of the basic issues muddled by the Gang of Four. They vilified scientists, professors and engineers distinguished for their contributions as bourgeois academic authorities, and all outstanding young and middle-aged scientists and technicians trained by our party and state as revisionist sprouts. . . The revolutionary cause needs outstanding revolutionaries, and so does the scientific cause need outstanding scientists. . . The history of science shows what great results can be produced in the field of science from the discovery of a genuinely talented person!"

To increase production and general efficiency, Teng said, scientific techniques and understanding should be widespread in Chinese society. But, in another departure from the thinking of the discredited past, he said science should permeate society, rather than the reverse.

"Extensive application of advanced science and technology to industry, agriculture and a greater, faster, better and more economical growth of production can come about only through large-scale technical transformation and scientific experiments in every enterprise and every production brigade. At the same time," he continued, "we must work energetically for the success of specialized scientific research institutions.

"Professional scientists and technicians form the mainstay of the revolutionary movement for scientific experiment. Without a strong contingent of professional researchers of high caliber, we could hardly scale the heights of modern science and technology, and it would be difficult for the scientific experiment movement of the masses to advance. We must get the specialists integrated with the masses."

Since the Chinese candidly estimate that they are scientifically 15 to 20 years behind the advanced Western nations, their new-found lust for giving sovereignty to science obviously stems from a desire to overcome their backwardness. It is interesting, however, to contrast their designs with the growing pressures in the West for public participation in scientific matters. These pressures are, of course, relatively slight; nonetheless, they are increasing, as is evidenced by requirements for lay membership on review boards for experiments involving human subjects, the Cambridge City Council's restrictions on recombinant DNA research, and the National Science Foundation's Science for Citizens program, small though it may be.

Perhaps the lesson of all this is that science is too important to be left to scientists only when it's thriving; when it's far behind, however, as in contemporary China, the politicians readily conclude that science should be run by scientists. —DSG

Kennedy Tells NIH that Times are Changing

Through personal interest and position — the chairmanship of the Senate Subcommittee on Health and Scientific Research — Edward M. Kennedy is that chamber's most influential figure on matters related to biomedical research. No other reason, therefore, is required for quoting extensively from an address that he delivered April 3 to the staff of the National Institutes of Health, Bethesda, Md.:

Neither Congress nor the public wishes to dismantle or impair the superb biomedical research capability which this country has built up over the years... But we cannot ignore the real changes that are taking place. An old era is ending and a new one is beginning. Biomedical research, once the most favored child of Congress, has become one of many favored children. It remains unique and important in its own way. But it must accept the family rules like all the other beneficiaries of the federal budget.

Our challenge is to make this new and still-evolving relationship work. That job will require accomodation on all sides. It will require changes in the federal institutions which support our health science programs. It will require corresponding changes in the role and attitudes of the research community and in the Federal Government and Congress....

In recent years, we have seen too many confusing swings in research priorities and in research funding. These upheavals are unfair to research scientists who have dedicated themselves in good faith to the directions mandated by Congress, only to have the directions change because the mind of Congress changes. The biomedical research community is entitled to clearer signals from Congress and the Administration, so that we can avoid the waste and inefficiency that have accompanied the conflicting signals of recent years...

During the last decade alone, Congress enacted the National Heart, Lung and Blood Act, the National Cancer Act, the National Diabetes Research and Education Act, and the National Arthritis Act.

We also launched specific research programs for sudden infant death syndrome, hemophilia, sickle cell anemia and other genetic diseases... It is no wonder that... Congress is now called the "Disease of the Month" club.

...[E]ach of these programs...has made valuable contributions to science and human health... But in the future, Congress must recognize that this disease-by-disease approach to federal support for biomedical research is incapable of working adequately in a period of tight budgets....

Already, one conclusion seems clear. Over the past six years, Congress has invested heavily in programs to understand and control cancer. But the rapid growth in the cancer programs has not been matched by comparable increases in the budgets of the other institutes. An unhealthy balance has been created among NIH programs and among the various research disciplines throughout the United States. As one of the chief authors of the cancer legislation, I can assure you that we never intended to promote the cancer effort at the expense of the many other excellent research programs of NIH. One of our highest priorities must be to correct this imbalance without curtailing progress in the war on cancer....

In the past, Congress and the American people have given great freedom to researchers to decide which specific projects deserve support and which do not... Americans have granted the scientific community this public trust because they expect scientists to judge their own work with the honesty and objectivity which characterizes good science.

It is distressing, therefore, to discover that the research community, acting through its peer review system, has systematically neglected certain broad research areas.

Why, for example, does the NIH spend only $20-40 million a year on nutrition research, out of a total of $2.8 billion?

Why is so little attention paid to behavioral research in the treatment and cure of disease? While infectious diseases used to be the most burdensome illnesses, we now see cardiovascular disease, cancer, lung disease, accidents, homicide and violence as the major threats to life and health. These afflictions have strong behavioral components.

The National High Blood Pressure Education Program is an example of what you can accomplish here when the physical and behavioral sciences work together. No NIH program in our history has done more to improve the health of Americans.

In talking of neglected research areas, I do not want to convey the impression that NIH must be responsible for overseeing all health research in the Federal Government. Recently I introduced the National Institutes of Health Care Research Act of 1978, (S. 2466) ... to make certain that health services research,

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Carter Seeks New R&D Unit for Foreign Aid

In a speech in Caracas March 29, President Carter referred to the needs of developing countries, and said, "To assist them, I am proposing a new US Foundation for Technological Collaboration." What's that about?

The answer is that over the past several years, various calls have been made for centralizing, or at least orchestrating, the various scientific and technical efforts carried on by US government agencies for assisting economic development in the poorer countries. The most recent of these came last summer in a Brookings Institution study which recommended the establishment of an International Development Foundation, independent of, but close to, the Agency for International Development.

The Brookings idea was under consideration at various points in the federal maze when the late Hubert Humphrey introduced a bill to reorganize and consolidate all US foreign aid efforts. The bill, which is becalmed in Congress, made no reference to pulling together research-related activities. But given the existence of the Humphrey bill and the Carter Administration's preference for consolidating federal activities, the idea of a free-standing agency was abandoned.

As a result, planning is now underway to establish the Foundation for Technological Collaboration as part of the Agency for International Development. Discussions along those lines are being conducted by representatives of AID and the White House Office of Science and Technology Policy (OSTP), with the participation of officials from other agencies, including the Office of Management and Budget and the National Security Council.

While the scope and scale of the proposed Foundation are yet to be worked out, it is expected that it would start out with an annual budget of some $250 million in ongoing activities now mainly concentrated in AID but also extending to the Department of Agriculture and other agencies. "New" money — that most cherished of commodities in Washington — has not been decided on, but there's some talk of perhaps as much $50 million of that in Fiscal 1980, which is the expected startup date for the Foundation.

As for the programs of the Foundation, here, too, the planning is still too early for details to be available. But the main thrusts involve research and training aimed particularly at strengthening the scientific and technical infrastructures of developing countries. There's some attention, too, to assisting US institutions that deal with problems of less-developed nations. But one Administration aide involved in planning the Foundation emphasized that aid to US universities would be only a small and incidental part of the scheme.

Legislative and budgetary details are now being worked out, and the intention is to include the Foundation in the budget that the President will send to Congress next January.

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epidemiology, the health-related social sciences, and the assessment of new clinical technologies get the attention, the prestige, and the stable funding they deserve. I proposed a new institution to house these research disciplines, because in some respects they lie outside the traditional mission of the NIH.

However, I want to make one thing very clear. There must and will continue to be overlap between the mission of NIH and other agencies, and I would be disappointed and disturbed if, as a result of new legislation, NIH were to deemphasize or discontinue its work in epidemiology, in the primary prevention of disease, in clinical trials or in the behavioral sciences.

There is one additional legislative issue I would like to mention because it underscores another area where the research community can do better than it has in the past. Last month I introduced the "Women in Science and Technology Equal Opportunity Act" . . . to help eliminate the educational and institutional barriers which for 50 years have virtually excluded women from careers in science.

Nationwide, only 25 per cent of our biomedical scientists are women. Here at NIH, women professionals and scientists earn only 62 per cent of what men do, and have only one-seventh the chance of receiving a promotion. . . .

If Congress and the research community do their part (NIH) can attain an even more preeminent position in the future, leading the way toward a creative new era of medical progress. That is what Congress and the American people want for their health dollar, and I stand ready to work with you to achieve the goals we share.

(To obtain a complete text, request a copy of Senator Kennedy's April 3 speech at NIH from the Subcommittee on Health and Scientific Research, Human Resources Committee, US Senate, Washington, DC 20510).

Press and Predecessors Hold a Bull Session

Frank Press met for three hours in the White House April 23 with a very select group — his seven predecessors in the post of presidential science adviser, plus a handful of others who have been closely associated with that job.

There was no agenda for the meeting, nothing was decided, and there was little, if any, wrangling in this elite assemblage, whose members, though not regularly in contact with each other, remain on good terms through Democratic and Republican administrations. Uniting them, it seems, is a sense of responsiblity, perhaps also some awe, concerning the highest science post in the US government; something as petty as party differences doesn't seem to interest these elder statesmen of science.

Press described his role in the Carter Administration, and apparently impressed his colleagues with his account of his heavy involvement in budget planning. According to one ex-science adviser, "If he's into the budget as deeply as he said he is, he's in deeper than any of us ever were."

Press was asked if he plans to revive the President's Science Advisory Committee, the one-time council of scientific elders on which virtually all presidential science advisers served at one time or another. He replied that Carter was generally opposed to standing advisory bodies if other arrangements were feasible, and that he and the President felt that the advisory function for research-related matters could be handled with ad hoc panels at the White House level.

The group was told that the office is focusing its attention on means of stimulating industrial innovation.

Press said that he does not meet alone with the President, but has frequent contact with him as a member of one or another group whose interests include research-related matters.

In general, the alumni came away with the impression that their old shop is in good hands and that Press is influential in science-policy affairs.

The one reservation was on military matters, long ago a major area of interest for the White House science office. However, the process of exclusion from military R&D began with the Johnson Administration and no presidential science adviser since then has carried much weight on that subject.

Press told his collegaues that he's been involved with the MX missile deliberations and has also had an "input" on discussions of a comprehensive nuclear test ban. But he left the impression that his role was peripheral in these matters, which is not surprising in view of the fact that a full-fledged physicist is head of the Defense Department, and Carter, unlike Eisenhower and Kennedy, has ample sources of advice on military technology.

Attending the meeting were: Lee DuBridge, James R. Killian, George Kistiakowsky, Jerome B. Wiesner, Donald Hornig, Edward E. David Jr., and Guy Stever — all of whom were fulltime directors of the White House science office since its formal establishment in 1957. In addition, the attendees included several persons closely associated with that office, in one capacity or another, among them: Isador Rabi, Simon Ramo, Ivan Bennett, and Frederick Seitz.

To the Editor

SGR (Vol. VIII, No. 4) volunteered the thought that researchers seeking information in other lands might find it useful to inquire of the science attaches assigned to US embassies. Not surprisingly, our suggestion has evoked a demurrer on the part of some of the attaches. The following is representative:

To the Editor:

I believe I reflect the views of my colleagues in thanking you for devoting the space you did to our program. We do thank SGR for informing its readers of our existence and of the compliment that we are generally well informed about R&D related matters in our countries of assignment. I believe all of us will do what we can to assist members of the US scientific community in their quest for information and contacts in our respective areas.

However, as your readers well know, there are many international channels of scientific communication and we assume that these are the normal sources that most of your readers would contact first. Thus, we could be viewed as a channel of last resort. An additional comment is that many of us are better informed on government R&D affairs in our countries of assignment and perhaps not as well informed on non-governmental affairs; again the requests placed in each office are different and will cause the development of a different spectrum of knowledge and contacts.

William C. Salmon,
Counselor for Scientific
and Technological Affairs,
US Embassy, Paris

Hints on Academic R&D Policy Initiatives

White House Science Adviser Frank Press indicated some time ago that the second year of the Carter Administration would probably produce some major recommendations for changes in the federal government's care and feeding of academic science. Though nothing definite has yet been made public, some clues are to be found in a speech Press gave April 7 at Florida State University, Tallahassee. Titled "Universities in the National R&D Effort," the speech included the following passages:

Of course, funding is not the only determinant of opportunity and success. We have to take a fresh and realistic look at the whole system. We have to question whether, in view of the current trends, resources and needs, some institutional changes may not be in order — changes that would continue to give us the benefits which the present system produced at the height of its effectiveness.

One possible arrangement, that I have suggested before coming into government, is that a number of university science departments might be designated as National Research Centers. Such Centers might receive coherent area grants for 3- to 5-year periods from government agencies, but many projects in them would be staffed primarily by recent Ph.D.s supported full-time by government grants, with the universities offering rolling 3-year periods of tenure and space and other amenities to make the positions attractive.

Faculty members in departments might become researchers at the Centers for periods of 1 to 3 years, and vice versa. These Centers would enable universities to bring young scientists into the university community, in close connection with established departments. In this way, it would ensure the flow of the best young minds into the basic research structure of the universities. . . .

Of course, we need to maintain in our universities what Robert Cannon of CalTech refers to as, "a healthy and stimulating balance between the vigor and fresh genius of youth and the cumulative wisdom and accomplishment of years." There are a number of university scientists between the ages of 55 and 65 who continue to make valuable contributions where they are.

There are also those who would like to seek alternate ways to contribute during those years. A number of plans have been proposed to deal with this situation. And their feasibility should be studied.

Among them is the concept of a senior fellowship that would enable the retired university scientist or engineer to work in local government or foreign technical assistance programs, teach at a small college that cannot afford science faculty, write, or staff professional or educational organizations. There are innumerable ways that such people can make valuable contributions, while at the same time allowing young people opportunities at the universities. The time is here when we have to consider, and begin to implement, some of the new institutional arrangements. And we can do this while still maintaining the ties between research and education that have been responsible for our outstanding success in science and technology.

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